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LISTS OF SPECIES

Fishes of the Kwilu River (Kasai basin, central Africa): A list of species collected in the vicinity of Kikwit, Bandundu Province, Democratic Republic of Congo

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ABSTRACT: A list of fishes collected in the vicinity of Kikwit on the Kwilu River, a large left bank tributary of the Kasai River in the Democratic Republic of Congo is provided. One hundred and thirteen species distributed in 21 families are reported, and of these 29 species are recognized as representing new records for the region. Lack of up-to-date taxonomic and distributional knowledge of African fishes, a problem particularly acute in the central Congo basin, is clearly reflected in this high number of range extensions. While preliminary, this contribution serves as a useful starting point for efforts to understand the ichthyofaunal composition and biogeographic history of the Kasai system; one of the most poorly documented river systems in central Africa.

INTRODUCTION

The Kwilu is a large left bank tributary of the Kasai River, itself the main southern tributary of the Congo River that drains almost one third of the entire Congo basin. The headwaters of the Kwilu arise on the Kasai Shield in the Angolan highlands at an elevation of 1000-1800 meters above sea level (m.a.s.l.) and descend steeply towards the flat central Congo Basin (300-500 m. a.s.l.) in the Democratic Republic of Congo (Figure 1). The Kwilu is about 965 km in length with a wet-season inundation area of 1550 km^2 (Hughes 1996). At its mouth the Kwilu joins the Kwango River just south of the provincial capital of Bandundu and together these two tributaries enter the main channel of the Kasai River some 50 km upstream of the Kasai-Fimi confluence. The Kwilu, like much of the Kasai system, is extremely poorly known ichthyologically (Stiassny *et al*. 2011) and, as part of an ongoing survey of the fishes of the northwestern Kasai basin, collections of fishes were made along a 35 km reach of the Kwilu River in the vicinity of Kikwit, a river port some 250 km upstream of Bandundu.

Here we provide a preliminary list of fishes collected in the Kwilu main channel in the region of Kikwit. Although undoubtedly incomplete, given the paucity of information on the fishes of this system we believe that this list serves as a useful starting point for efforts to understand the ichthyofaunal composition and biogeographic history of the Kasai system; one of the most poorly documented river systems in central Africa. Future collections in the region are planned, with an emphasis on collecting the numerous, small affluent streams feeding into the main channel of the Kwilu. Efforts to collect upstream where numerous rapids and cataracts accompany the narrowing of the channel as it approaches the Angolan border, is challenging but will undoubtedly render additional species and serve to complete this inventory.

MATERIALS AND METHODS

The list of species provided here is based on collections made during two field expeditions to the Kikwit region of the Kwilu River. All materials are housed in the Ichthyology Department of the American Museum of Natural History (AMNH), New York, and associated data is accessible at http://entheros.amnh.org/db/emuwebamnh/.

Collections were made at the beginning of the rainy season in 2010 (September), and during the short dry season in 2011 (mid-February). Five sites along a 35 km stretch of the Kwilu River from the port of Kikwit to the small village of Ibanzi were sampled (Table 1; Figure 1). Sites were selected to sample accessible regions of the river subjected to varying degrees of anthropogenic impact, from heavily degraded to almost pristine (Figure 2).

Notes on Collection Sites

Site 1 (Kwilu Port, Figure 2A) is in the center of Kikwit and heavily urbanized with little fringing vegetation and few emergent grasses. Site 2 (Kwilu Beach, Figure 2B) is an assembly point for local fishermen and the fishes purchased there lack associated locality data but nonetheless augment our collecting efforts and include one species not recorded elsewhere (Table 2). Site 3 (Suka Ntima, Figures 2C and 3A) is situated at the outskirts of Kikwit. The river at Suka Ntima is approximately 40m wide and between 10-20m deep. Agricultural plots replace riparian cover and the shoreline is fringed with emergent grasses. Site 4 (Kikwit-Mbuji, Figures 2D and 3B) is similar in most aspects to the previous site, but the wet-season floodplain is larger at Mbuji, and at the height of the rainy season the width of the river can exceed 60 m. Large clumps of invasive *Eichhornia* sp. are present in backwaters between Suka Ntima and Mbuji (Figure 3E), but according to local reports present no navigational

hazards. Site 5 (Carrefour, Figures 2E and 3D) is situated upstream of a series of rapids formed where the river width rapidly narrows. At Carrefour, the river widens to a width of about 20 m, and is reportedly extremely deep (no depth measurement was possible at this site). The shoreline is fringed with high gallery forest, with some small-scale agricultural plots and localized disturbance. Close to this site a series of large ponds (etangs) have been dug and villagers stock these with fishes collected in the river, as well as the widely introduced cichlid, *Oreochromis niloticus* (Linneaus, 1758). Periodically the ponds are drained and the fishes harvested (Figure 3F). Site 6 (Ibanzi, Figure 2F) is the southernmost site sampled and separated from Site 5 by a series of large rapids. The entire shoreline is heavily forested with little disturbance. The riverbed is extremely rocky, with large blocks of rock strewn along the shoreline and small, interspersed sandy beaches.

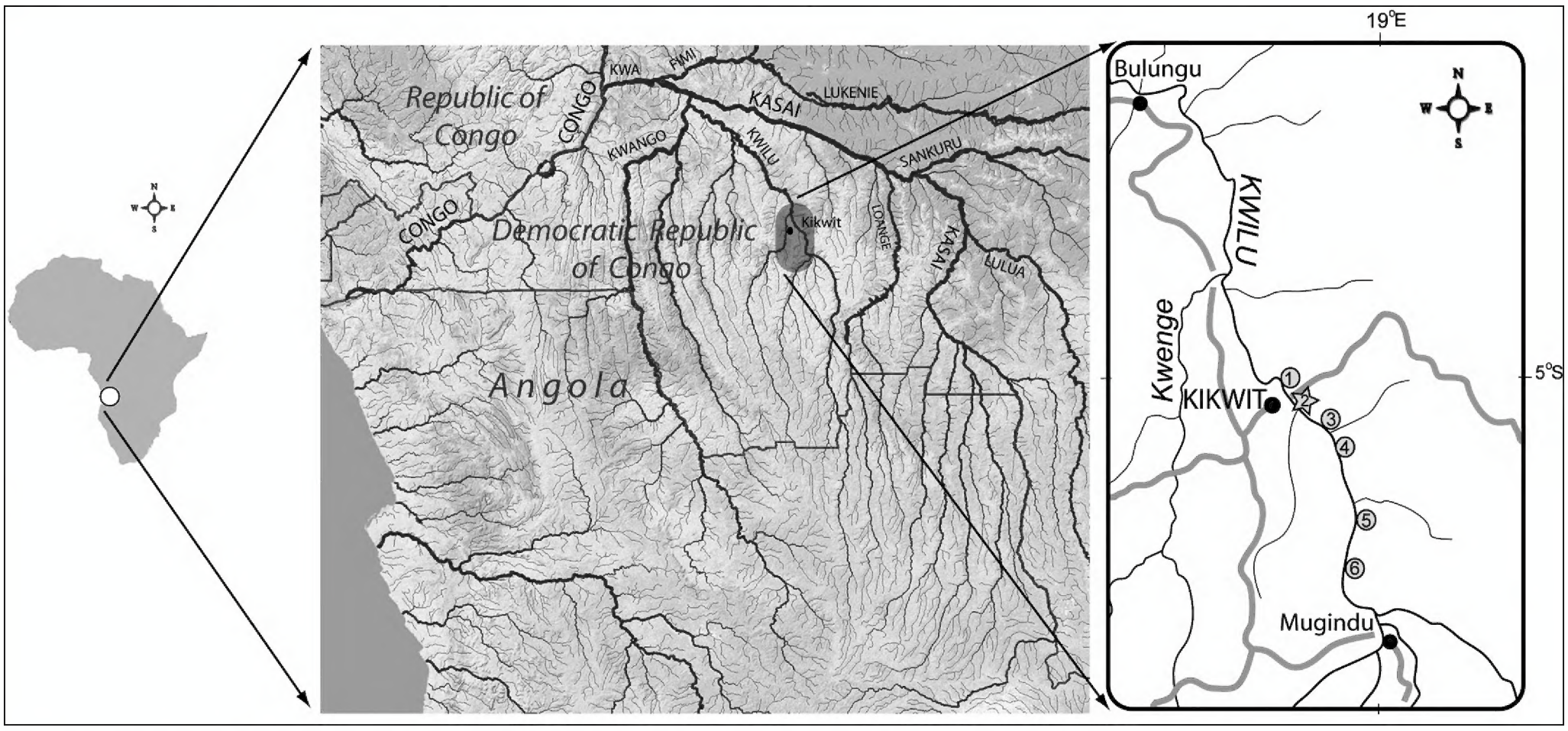

FIGURE 1. Location of Kwilu River and associated drainages in Central Africa, with collection sites inset (rhs).

TABLE 1. Coordinates and site data.

SITE	LOCALITY	COORDINATES	ALTITUDE (M)	SUBSTRATE	COVER	pH
1	Kwilu Port	05°1'49.69" S, 18°49'52.86" E	349	Sand and gravel	Denuded	6.2
2 *	Kwilu Beach	05°2'53.16" S, 18°50'22.85" E				
3	Suka Ntima	05°3'34.45" S, 18°51'13.97" E	351	Sand and mud	Disturbed, few fringing shrubs and grasses, *Eichhornia*	6.2
4	Mbuji	05°4'18.48" S, 18°52'9.66" E	346	Gravel, mud and sand	Disturbed, fringing shrubs, emergent grasses, *Eichhornia*	5.8
5	Carrefour	05°11'29.76" S, 18°56'58.09" E	345	Sand, mud, leaves	Gallery forest with minor agricultural disturbance	5.9
6	Ibanzi	05°14'36.46" S, 18°57'12.82" E	421	Rock, gravel and mud	Dense gallery forest	6.5

* Kwilu Beach, is an assembly point for local fishermen and traders. Fishes collected in the vicinity were purchased at this site and lack accurate locality data.

Fish sampling

Only locally acceptable fishing practices were employed for this survey, and these constitute three main techniques: cast nets deployed from wooden pirogues (canoes) in deep water, seine nets of varying sizes, commonly used by local fishing collectives, over sandy substrates (Figure 3B) and the third method employed was "Sambwisa", the local name for a particular use of a fine-mesh seine (made from mosquito netting). The latter technique involves encircling a large area of dense vegetation within the Sambwisa and then physically removing every blade of vegetation until only fish remain in the fine mesh net (Figure 3C). This technique is highly effective when carried out by experienced teams of fishermen, but is unfortunately extremely destructive to the vegetation.

Taxonomic nomenclature used herein follows Brooks *et al.* (2011), which is based primarily on Eschmeyer (2010) but with a few modifications. All fishes were collected and exported with permission of the Congolese Ministère de l'Agriculture, Secrétariat General à l'Agriculture, Pêche et Elevage, Direction des Pêches (Permit# 07/DP/SG/AGRI/2010 and Permit# 03/DP/SG/AGRI/2011, both on file at AMNH).

RESULTS AND DISCUSSION

A total of 1074 individuals belonging to 113 species, distributed in 21 families and eight orders are represented in Table 2, with their distribution among sites indicated in

columns 1-6. In column 7 distribution data culled from the recently published IUCN assessment of the status and distribution of central African fishes (Brooks *et al.* 2011), is used to indicate which of the Kwilu species are known to occur in the broad region of the Kasai drainage. The data for the IUCN assessment is a compilation of point data drawn from Stiassny *et al.* (2007) and from legacy collections housed in the Africa Museum, Tervuren (MRAC) and the AMNH, that has been reviewed by taxonomic experts prior to publication (Darwell and Smith 2011). While these comparative data are minimal for the Kwilu River itself, Brooks *et al.* (2011) do provide data on fishes from the Kasai main channel and certain Kasai tributaries, thereby providing the best available comparison for the Kwilu River list provided herein. Based on these data we tentatively recognize 29 species represented in our Kwilu collections that have either not previously been recorded from the Kasai basin or are known only from isolated regions of the Kasai distant from the Kwilu. Most of these species (Table 2\) represent significant range extensions within the Congo basin, and a selection of such are illustrated in Figures 4 and 5. A single exotic species, *Oreochromis niloticus*, was found during the survey at site 5 (Carrefour). The specimen is presumably an escapee from one of the fish ponds situated inshore near the village of Carrefour (Figure 3F).

Lowenstein *et al.* (2011) highlight the problems associated with compiling species inventories in the absence of up-to-date taxonomic and distributional knowledge of African fishes, a problem particularly acute in the central Congo basin. We acknowledge that insufficient taxonomic research has been conducted on much of the region's ichthyofauna and that some identifications to species presented here should be considered tentative, but nonetheless represent the best data available for the region.

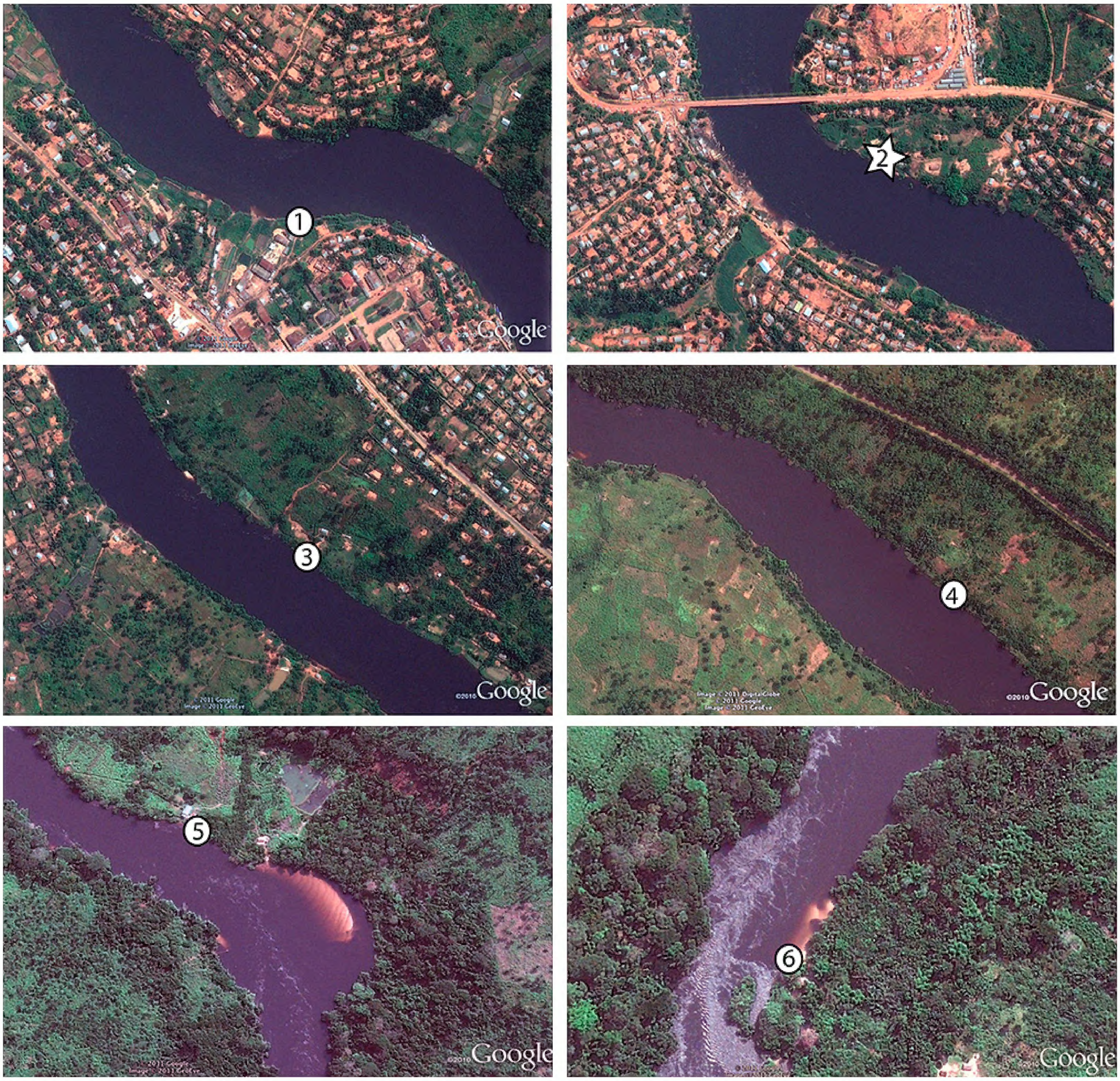

Figure 2. Site locations derived from Google Earth projections. Site 1, Kwilu Port; Site 2, Kwilu Beach (fish landing); Site 3, Suka Ntima; Site 4, Mbuji; Site 5, Carrefour; Site 6 Ibanzi.

FIGURE 3. Localities and fishing techniques: A) view at Suka Ntima; B) Use of seine at Mbuji; C) Sambwisa use at Suka Ntima; D) view of Carrefour; E) Eichhornia near Mbuji; F) Collecting fish in drained pond at Carrefour.

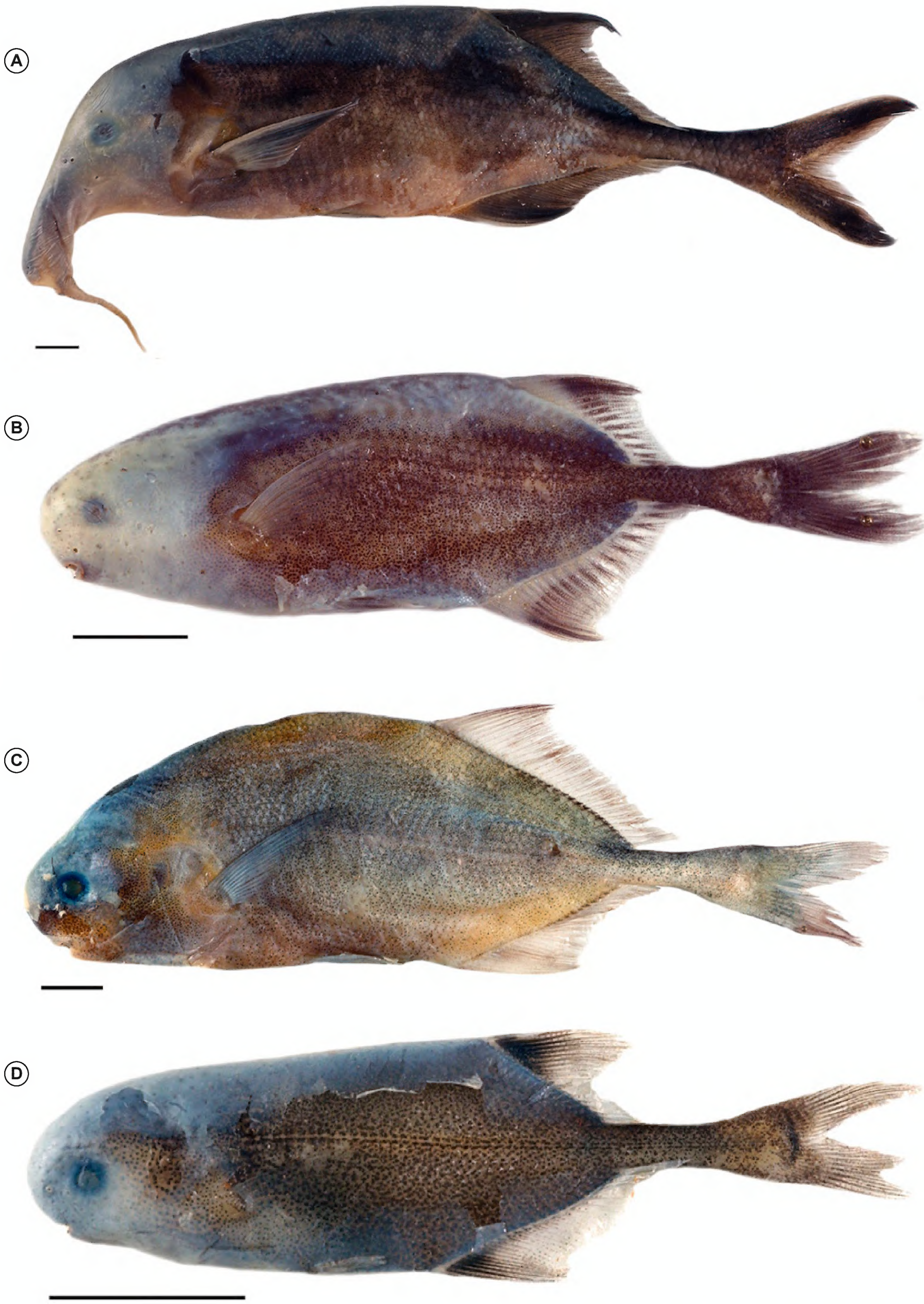

FIGURE 4. Selected species whose occurrence in the Kwilu River represents a significant range extension within the Congo basin: A) *Campylomormyrus mirus*, B) *Stomatorhinus patrizii*, C) *Cyphomyrus plagiostoma*, D) P*ollimyrus maculipinnis*.

FIGURE 5. Selected species whose occurrence in the Kwilu River represents a significant range extension within the Congo basin: A) *Distichodus teugelsi,* B) *Nannocharax schoutedeni*, C) *Phago intermedius*, D) *Barbus matthesi*, E) *Opsaridium maculicauda.*

Table 2. List of species collected at sites 1-6 along the main channel of the Kwilu River near Kikwit. In column 7 distribution data culled from a recently published IUCN assessment of the status and distribution of central African fishes (Brooks *et al.* 2011), is used to indicate which Kwilu species are known to occur in the broad region of the Kasai drainage.

	AMNH NUMBER	1	2	3	4	5	6	7
POLYPTERIFORMES								
Polypteridae (1)								
Polypterus ornatipinnis Boulenger, 1902	AMNH 253680	-	-	X	-	-	-	X
CLUPEIFORMES								
Clupeidae (3)								
Poecilothrissa congica Regan, 1917	AMNH 253697, 253788	X	-	-	-	X	-	X
Potamothrissa acutirostris (Boulenger, 1899)	AMNH 253787	X	-	-	-	X	-	X
Potamothrissa obtusirostris (Boulenger, 1909)	AMNH 253772, 253786	X	X	-	-	X	X	-
OSTEOGLOSSIFORMES								
Pantodontidae (1)								
Pantodon buchholzi Peters, 1876	AMNH 253679, 253800	-	-	X	-	X	-	X
Notopteridae (1)								
*Xenomystus nigr*i (Günther, 1868)	AMNH 253699, 253727	X	X	X	X	X	X	X
Mormyridae (30)								
Campylomormyrus alces (Boulenger, 1920)	AMNH 252510, 252541	-	-	-	-	X	X	X
Campylomormyrus numenius (Boulenger, 1898)	AMNH 252438, 252531	X	-	-	-	X	-	X
Campylomormyrus mirus (Boulenger, 1898)	AMNH 252509	-	-	-	-	X	-	-
Campylomormyrus tamandua (Günther, 1868)	AMNH 253645, 253741	-	-	-	-	X	-	X
Cyphomyrus plagiostoma (Boulenger, 1897)	AMNH 253817	-	-	-	-	X	-	-
Cyphomyrus psittacus (Boulenger, 1897)	AMNH 253818	-	X	-	-	X	X	X
Cyphomyrus weeksii (Boulenger, 1902)	AMNH 253819	-	-	-	-	X	-	-
Genyomyrus donnyi Boulenger, 1898	AMNH 252535, 252568	-	-	-	-	-	X	-
Gnathonemus petersii (Günther, 1862)	AMNH 253770, 253812	-	X	X	X	X	X	X
Marcusenius fuscus (Pellegrin, 1901)	AMNH 253738	-	-	-	X	-	-	-
Marcusenius greshoffii (Schilthuis, 1891)	AMNH 253820	-	X	-	-	X	X	X
Marcusenius kutuensis (Boulenger, 1899)	AMNH 252496, 252574	X	-	-	-	-	X	X
Marcusenius macrolepidotus (Peters, 1852)	AMNH 252437	X	-	-	-	-	-	X
Marcusenius monteiri (Günther, 1873)	AMNH 252582, 252583	X	-	-	-	X	X	X
Marcusenius moorii (Günther, 1867)	AMNH 253706	X	-	-	-	-	-	X
Marcusenius schilthuisiae (Boulenger, 1899)	AMNH 253686	-	-	X	-	-	-	-
Mormyrops anguilloides (Linneaus, 1758)	AMNH 252495, 253689	X	-	X	-	-	-	X
Mormyrops attenuatus Boulenger, 1898	AMNH 253740	-	-	-	X	-	-	X
Mormyrops microstoma Boulenger, 1898	AMNH 253687	-	-	X	-	-	-	-
Mormyrops nigricans Boulenger, 1899	AMNH 253688, 253739	X	-	X	X	-	-	X
Mormyrus caballus Boulenger, 1898	AMNH 252586	X	-	-	-	-	-	X
Petrocephalus binotatus Pellegrin, 1924	AMNH 252528	-	-	-	-	X	-	-
Petrocephalus christyi Boulenger, 1920	AMNH 253662, 253815	-	-	-	-	X	X	X
Petrocephalus grandoculis Boulenger, 1920	AMNH 253643	-	X	-	-	X	X	-
Petrocephalus pulsivertens Lavoué, Sullivan and Arnegard, 2010	AMNH 253814	-	-	-	-	X	X	-
Petrocephalus zakoni Lavoué, Sullivan and Arnegard, 2010	AMNH 252494, 253771	X	-	X	X	-	-	-
Pollimyrus maculipinnis (Nichols and LaMonte, 1934)	AMNH 253684, 253813	-	-	X	-	X	X	-
Pollimyrus nigripinnis (Boulenger, 1899)	AMNH 253683	-	-	X	-	-	-	-
Pollimyrus pulverulentus (Boulenger, 1899)	AMNH 253661	-	-	-	-	-	X	-
Stomatorhinus patrizii Vinciguerra, 1928	AMNH 253737, 253816	-	-	X	X	X	X	-
CHARACIFORMES								
Alestidae (16)								
Alestes liebrechtsii Boulenger, 1898	AMNH 253615	X	X	-	-	-	X	X
Alestopetersius n.sp. Mbimbi and Stiassny, in press	AMNH 253473, 253475	X	X	X	X	X	X	-
Alestopetersius sp."mbuji" Mbimbi and Stiassny, in press	AMNH 252479	-	-	-	X	-	-	-
Bathyaethiops caudomaculatus (Pellegrin, 1925)	AMNH 253778	-	-	-	X	X	-	X
Brachypetersius altus (Boulenger, 1899)	AMNH 253712, 253777	-	X	-	X	X	X	X
Brycinus comptus (Roberts and Stewart, 1976)	AMNH 253780	X	-	-	-	X	-	-
Brycinus imberi (Peters, 1852)	AMNH 253714	X	-	-	X	-	X	X
Brycinus grandisquamis (Boulenger, 1899)	AMNH 253757, 253779	-	X	-	X	X	X	X
Brycinus macrolepidotus (Valenciennes, 1850)	AMNH 252427	X	-	-	-	-	-	X
Brycinus poptae (Pellegrin, 1906)	AMNH 253713	-	-	-	X	-	-	-

TABLE 2. ***CONTINUED.***

Bryconaethiops boulengeri Pellegrin, 1900	AMNH 253648, 253773	X	X	-	-	X	X	X
Bryconaethiops microstoma Günther, 1873	AMNH 253695, 253913	X	X	X	-	X	X	X
Hydrocynus vittatus Castelnau, 1861	AMNH 252472	X	-	-	-	-	-	X
Micralestes humilis Boulenger, 1899	AMNH 253708, 253774	X	-	X	X	X	X	X
Phenacogrammus aurantiacus (Pellegrin, 1830)	AMNH 252850, 253710	-	-	-	X	X	-	X
Phenacogrammus interruptus (Boulenger, 1899)	AMNH 253709, 253775	X	X	-	X	X	X	X
Citharinidae (1)								
Citharinus gibbosus Boulenger, 1899	AMNH 252470	X	-	-	-	-	-	X
Distichodontidae (13)								
Belonophago hutsebouti Giltay, 1929	AMNH 253621	-	X	-	-	-	-	X
Distichodus affinis Günther, 1873	AMNH 253671, 253717	X	X	X	X	-	X	X
Distichodus fasciolatus Boulenger, 1898	AMNH 252492, 252467	X	-	-	-	-	X	X
Distichodus teugelsi Mamonekene and Vreven, 2008	AMNH 253716, 253758	-	X	X	X	-	-	-
Eugnathichthys macroterolepis Boulenger, 1899	AMNH 253756, 253784	X	X	-	X	X	-	X
Hemigrammocharax uniocellatus (Pellegrin, 1926)	AMNH 253690, 253742	-	-	X	-	X	-	X
Mesoborus crocodilus Pellegrin, 1900	AMNH 253668, 253781	X	X	X	-	X	-	X
Microstomatichthyoborus bashforddeani Nichols and Griscom, 1917	AMNH 252499, 253715	X	-	-	X	-	-	X
Nannocharax brevis Boulenger, 1902	AMNH 253723	-	-	-	-	X	-	-
Nannocharax gracilis Poll, 1939	AMNH 253759, 253785	-	-	X	X	X	-	X
Nannocharax schoutedeni Poll, 1939	AMNH 253719	-	-	-	X	-	-	X
Phago boulengeri Schilthuis, 1891	AMNH 253669, 253782	X	-	X	-	X	X	X
Phago intermedius Boulenger, 1899	AMNH 252519, 253783	-	X	-	-	X	-	-
CYPRINIFORMES								
Cyprinidae (12)								
Barbus matthesi Poll and Gosse, 1963	AMNH 253652, 253791	X	-	-	-	X	X	-
Barbus mediosquamatus Poll, 1967	AMNH 253644	-	X	-	-	-	-	X
Barbus miolepis Boulenger, 1902	AMNH 253792	X	-	-	-	X	-	X
Clypeobarbus bomokandi (Myers, 1924)	AMNH 235653, 253793	-	-	-	-	X	X	-
Clypeobarbus pleuropholis (Boulenger, 1899)	AMNH 253764, 253794	X	-	X	X	X	X	X
Labeo lineatus Boulenger, 1898	AMNH 252521	-	-	-	-	X	-	X
Labeo parvus Boulenger, 1902	AMNH 253629	-	X	-	-	-	-	X
Labeo weeksii Boulenger, 1909	AMNH 252522	-	-	-	X	X	X	X
Leptocypris modestus Boulenger, 1900	AMNH 253789	X	-	-	-	X	-	X
Leptocypris sp.	AMNH 252482, 253763	X	-	-	X	-	-	X
Leptocypris weeksii (Boulenger, 1899)	AMNH 253722, 253790	-	X	-	X	X	X	X
Opsaridium maculicauda (Boulenger, 1920)	AMNH 253762	-	-	-	X	-	-	-
SILURIFORMES								
Bagridae (1)								
Bagrus ubangensis Boulenger, 1902	AMNH 252465, 253703	X	-	-	-	-	-	X
Claroteidae (5)								
Auchenoglanis occidentalis (Valenciennes, 1840)	AMNH 253702, 253730	X	X	X	X	-	X	X
Chrysichthys cranchii (Leach, 1818)	AMNH 253704	X	-	-	-	-	-	X
Chrysichthys cf. *habereri* Steindachner, 1912	AMNH 253657	-	X	-	-	-	X	-
Chrysichthys ornatus Boulenger, 1902	AMNH 253640, 253804	X	-	X	-	X	-	X
Parauchenoglanis punctatus (Boulenger, 1902)	AMNH 252556	-	-	-	-	-	X	X
Schilbeidae (3)								
Pareutropius debauwi (Boulenger, 1900)	AMNH 253806, 253863	X	-	-	X	X	X	X
Schilbe grenfelli (Boulenger, 1900)	AMNH 253805	X	-	-	-	X	-	X
Schilbe marmoratus Boulenger, 1911	AMNH 253681, 253731	X	-	X	X	-	X	X
Clariidae (3)								
Clariallabes teugelsi Ferraris, 2007	AMNH 253729	-	-	-	X	-	-	-
Clarias buthupogon Sauvage, 1879	AMNH 252558	-	-	-		-	X	X
Clarias pachynema Boulenger, 1903	AMNH 253769	-	-	-	X	-	-	X
Malapteruridae (2)								
Malapterurus gossei Norris, 2002	AMNH 253638	-	X	-	-	-	-	X
Malapterurus microstoma Poll and Gosse, 1969	AMNH 252523, 253701	X	-	-	-	X	-	X
Mochokidae (7)								
Synodontis alberti Schilthuis, 1891	AMNH 252559, 253808	-	-	-	-	X	X	X

Table 2. ***Continued.***

Synodontis congica Poll, 1971	AMNH 252466, 252557	X	-	-	-	-	X	X
Synodontis contracta Vinciguerra, 1928	AMNH 253734, 253810	X	-	-	X	X	-	X
Synodontis greshoffi Schilthuis, 1891	AMNH 253733, 253807	-	-	-	X	X	-	X
Synodontis nigriventris David, 1936	AMNH 253735, 253811	X	-	-	X	X	X	X
Synodontis nummifer Boulenger, 1899	AMNH 253809	-	-	-	-	X	-	-
Synodontis pleurops Boulenger, 1897	AMNH 252561	-	-	-	-	-	X	X
Amphiliidae (1)								
Belonoglanis tenuis Boulenger, 1902	AMNH 253803	-	-	-	-	X	-	X
PERCIFORMES								
Channidae (1)								
Parachanna obscura (Günther, 1861)	AMNH 252579, 253700	X	-	-	-	-	X	X
Anabantidae (2)								
Ctenopoma acutirostre Pellegrin, 1899	AMNH 253674, 253721	-	-	X	X	-	-	X
Ctenopoma kingsleyae Günther, 1896	AMNH 253720, 253760	-	-	X	X	-	-	X
Cichlidae (7)								
Hemichromis elongatus (Guichenot, 1861)	AMNH 253766, 253796	-	X	X	X	X	-	X
Lamprologus congoensis Schilthuis, 1891	AMNH 253765, 253795	-	X	-	X	X	-	X
Steatocranus sp.	AMNH 252542	-	-	-	-	-	X	-
Nanochromis teugelsi Lamboj and Schelly, 2006	AMNH 253677, 253728	-	-	X	X	-	-	X
Oreochromis niloticus (Linneaus, 1758) (introduced)	AMNH 253799	-	-	-	-	X	-	-
Tylochromis labrodon Regan, 1920	AMNH 253767, 253797	X	-	-	X	X	X	X
Tylochromis lateralis (Boulenger, 1898)	AMNH 253655, 253798	-	X	X	-	X	X	X
Mastacembelidae (2)								
Mastacembelus congicus Boulenger, 1896	AMNH 253802, 253821	-	-	-	-	X	X	X
Mastacembelus sp.	AMNH 252577	-	-	X	-	-	-	X
TETRAODONTIFORMES								
Tetraodontidae (1)								
Tetraodon miurus Boulenger, 1902	AMNH 253768, 253801	-	-	-	X	X	-	X

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